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SEASONAL VARIATION AND EFFECT OF NON-NATIVE INVASIVE VEGETATION ON TWO BIRD COMMUNITIES IN NORTHEAST OF BUENOS AIRES PROVINCE, ARGENTINA

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Resumen. – Variación estacional y efecto de vegetación exótica invasora sobre dos comunidades de aves en el noreste de la provincia de Buenos Aires, Argentina. – Estudiamos los patrones estacionales y el efecto de vegetación exótica invasora en comunidades de aves de bosque y zonas herbáceo-arbustivas adyacentes en el noreste de la provincia de Buenos Aires, Argentina. Diversidad, riqueza y densidad de aves fueron mayores en primavera-verano que en otoño-invierno en ambos tipos de ambiente. Además, encontramos diferencias significativas entre hábitats en la composición de especies en invierno, primavera y verano. Las variaciones estacionales en los atributos comunitarios se debieron principalmente a cambios en la abundancia de aves migratorias, mientras que la segregación de especies en ambos ambientes estuvo explicada en gran parte por la estructura de la vegetación de especies exóticas invasoras. La gran mayoría de las especies de aves estuvieron asociadas a sitios dominados por *Dipsacus fullonum* ó *Gleditsia triacanthos*, mientras que sólo cuatro especies estuvieron asociadas a sitios con altas densidades de *Ligustrum lucidum*. Nuestros resultados muestran que a pesar de la dominancia de vegetación exótica invasora en nuestro sitio de estudio, la estructura de la vegetación es el principal factor que estructura las comunidades de aves. Asimismo, algunas especies exóticas, como *L. lucidum*, tendrían un efecto negativo sobre las comunidades de aves al disminuir su diversidad, mientras que otras, como *D. fullonum* y *G. triacanthos*, tendrían un efecto positivo en comparación con *L. lucidum* al proveer no solo alimento durante gran parte del año, sino también sitios de nidificación.

Abstract. – We studied seasonal patterns and the effect of non-native invasive vegetation on bird communities in woodland and adjacent herbaceous-shrub areas in north-east Buenos Aires province, Argentina. Diversity, species richness and density of bird species were higher in spring and summer than in fall and winter in both habitat types. We also found significant between-habitat differences in bird species composition in winter, spring and summer. Seasonal variations were mainly due to changes in the abundance of migrants, whereas bird species segregation to each habitat was mostly explained by non-native vegetation structure. Most species were associated with sites dominated by either *Dipsacus fullonum* or *Gleditsia triacanthos*, whereas only four species were associated with high *Ligustrum lucidum* densities. These results show that despite the dominance of non-native invasive plant species at our study site, vegetation structure is still the main factor structuring bird communities. In addition, some plant species, such as *L. lucidum*, seem to have a negative effect on bird communities by reducing their diversity, whereas others, such as *D. fullonum* and *G. triacanthos*, seem to have a positive effect compared to *L. lucidum* by providing not only food resources during a great part of the year but also nest sites. *Accepted 8 June 2013.*

Key words: Analysis of similarity, bird diversity, canonical correspondence analysis, exotic plants, species composition, Argentina, *Dipsacus fullonum*, *Gleditsia triacanthos, Ligustrum lucidum.*

INTRODUCTION

Non-native invasive plants, which have been introduced in practically all parts of the world, may exert a range of negative impacts on native bird species (Inderjit 2005). Invasive plants may affect the population, community composition and stability of bird communities by altering resource availability, changing habitat structure and quality, or disturbing the stability of the food chain (Mack *et al.* 2000, Wilcox & Beck 2007). For instance, invasions by *Lythrum salicaria* in North America have led to decreases in wetland bird species (Blossey *et al.* 2001). Similarly, Australian wetlands invaded by *Urochloa mutica* have lower bird species richness than habitats without this grass (Ferdinands *et al.* 2005). However, some studies have found little or a positive effect of invasive plants on native bird species. For example, Fleishman *et al.* (2003) found that non-native plants in the Mohave Desert, California, USA, had no effect on bird species richness, whereas Wilcox & Beck (2007) and Gleditsch & Carlo (2010) respectively found that invasions by *Ligustrum sinense* and *Lonicera* spp. in North America were associated with an increase in bird abundance and species richness.

In Argentina, the Pampas region is the most degraded biome (Brown *et al.* 2006), partly due to human activities (Cueto & López de Casenave 2000b) and the introduction of invasive plant species (Cabrera & Zardini 1993). In the temperate forests of Buenos Aires Province, Argentina, landscape structure (Cueto & López de Casenave 2000b, Horlent *et al.* 2003), floristic composition (Cueto & López de Casenave 2000b), and migrant fluctuations and resource tracking (Cueto & López de Casenave 2000a, 2000b) are major factors in determining bird abundance and richness. However, the relationship between non-native vegetation structure and bird community attributes is still poorly understood. Some invasive riparian plants, such as *Gleditsia triacanthos* (Ghersa & León 2001, Leggieri 2010) and *Ligustrum lucidum* (Grau & Aragón 2000), form closed forests over watercourses, and threaten the native biota. However, numerous species of native birds are able to exploit these plants for feeding, shelter and nesting (e.g., Cueto & López de Casenave 2000b, 2002; Montaldo 1993, 2000, 2005; Montaldo & Roitman 2000).

The objective of this study was to evaluate the structure and dynamics of two bird communities in woodland and adjacent herbaceous-shrub areas dominated by non-native invasive plant species in northeast Buenos Aires Province, Argentina, during an entire year. The aims of our study were to: (1) estimate bird species richness, density and diversity in the two areas; (2) compare these attributes between habitat types and seasons; and (3) relate bird species composition and non-native invasive vegetation structure.

METHODS

Study area. The study was carried out in the Biosphere Reserve "Pereyra Iraola", Buenos Aires province, Argentina. This reserve has 10,246 ha and, together with the Punta Lara Natural Reserve, represents the area with the highest biodiversity of the province, with more than 120 species of plants and 314 species of birds (Ministerio de Asuntos Agrarios 2007, Pagano *et al.* 2012). The study site was located at the Estación Biológica de Aves Silvestres (34°52'S, 58°8'W). This riparian site of 11 ha is characterized by the presence of small

dispersed crops fields, grasslands and woodland surrounded by herbaceous-shrub land, thus constituting what is known as a novel ecosystem, i.e., an ecosystem with species compositions and relative abundances that have not occurred previously within a given biome (Hobbs *et al.* 2006). Dominant trees are *Ligustrum lucidum* and *Gleditsia triacanthos*, with some individuals of *Eucalyptus cinera*, and *Poncirus trifoliata*, all of which are exotic species. The herbaceous stratum is dense and continuous, dominated by the invasive *Dipsacus fullonum*, with lesser proportions of the native *Baccharis punctulata*, *B. notosergila*, and *Eryngium pandanifolium*, and the non-native *Carduus acanthoides, Cirsium vulgare*, and *Galega officinalis* (FXP pers. observ.). The climate is wet and warm-temperate; average temperatures in July and January are 9°C and 23°C, respectively. Annual precipitation is 900 mm; the rainiest months are January and February, without a well-defined dry season (Cueto & López de Casenave 2000a).

Bird survey. We conducted a total of 225 bird counts in 24 sampling periods from March 2011 to March 2012 by using 5-min point counts with a fixed radius of 50 m in a systematic design (Buckland *et al.* 1993, Ralph *et al.* 1993). Four points were located in the woodland patch and five points in the surrounding herbaceous-shrub land, separated by 150 m each (Ralph *et al.* 1993). The same observer surveyed these nine points once every two weeks. We conducted point counts within the first four hours after sunrise. We recorded the species and number of all birds seen or heard during the 5-min sampling period (Ralph *et al.* 1993). We recorded birds that were flushed from within the 50-m radius upon the observer's arrival as present (Ralph *et al.* 1993).

Vegetation measurements. Data on forest and herbaceous-shrub structure from vegetation plots were collected between September 2011 and January 2012. Since point counts locations were relatively homogeneous in vegetation composition and structure (FXP pers. observ.), 30-m radius plots were used (Huff *et al.* 2000). Each plot was placed within the location of each point count. *Dipsacus fullonum*, *Ligustrum lucidum*, *Gleditsia triacanthos* and herbaceous stems densities (ind/m^2) were measured. For plots with less than 300 individuals of *D. fullonum* or 20 trees, all individuals were counted; otherwise, plant species densities were measured based on the Byth & Ripley (1980) procedure by locating 10 random points within each plot. One trunk was considered as an individual in the case of trees, whereas one stem and one stem and its ramifications were considered as individuals in the case of herbs and shrubs, respectively (Matteucci & Colma 1982). Spatial patterns were previously determined with the Hopkins & Skellam's test (Hopkins & Skellam 1954).

Data analysis. We averaged bird counts over the six sampling periods within each season, so each sample point represented a mean richness, density and diversity of six data points. Diversity was estimated with the reciprocal form of the Simpson index (Hill 1973), expressed as: $D = 1/\sum p_i^2$, where p_i represents the proportion of individuals in the ith species. To detect significant responses of species richness, bird density and diversity in forested versus herbaceous-shrub habitats, we performed repeated-measures ANOVAs with season as a repeated factor, and type of habitat as a fixed factor. We used type III sum of squares for unbalanced designs (Shaw & Mitchell-Olds 1993). We tested the compound symmetry of covariance matrices, and used Tukey's multiple comparison test for comparing means (Quinn & Keough 2002). In all cases, we used the Greenhouse-Geisser correction to adjust the degrees of freedom of within-subjects effects (Winer 1971).

We assessed variation in community structure between habitats with the non-parametric analysis of similarity (ANOSIM, Clarke 1993). This analysis tests for differences in within-treatment versus between-treatment community dissimilarity and generates a *P*-value based on 10,000 Monte Carlo simulations (Clarke 1993). We used Bray-Curtis distance as a dissimilarity measure because it is most sensitive to differences in the most abundant species and less sensitive to infrequent species (Magurran 2004).

To assess the effect of vegetation on the whole bird assemblage, we performed a canonical correspondence analysis (CCA). This direct ordination technique relates community composition to known variation in the environment (ter Braak 1986). This method combines the algorithm of correspondence analysis on the species x point matrix, and a multiple regression analysis on environmental data (ter Braak 1986). According to González Oreja (2003), when modeling bird-habitat relationships, CCA seems to be more effective than indirect approaches (e.g., Principal Components Regression). We applied CCA to reveal habitat association by relating the bird abundance x sample matrix to the vegetation structure x sample matrix. Bird species with less than 1% of observations were excluded from the analysis, since rare taxa can introduce noise and be placed at extreme ends of the first ordination axes, relegating the major community trends to later axes (Gauch 1982). Deleting rare species is a useful way of reducing noise without losing much information (Cao *et al.* 2001, McCune *et al.* 2002). The relationships between the ordination axes and the vegetation variables were tested from 999 Monte Carlo permutations. We applied sequential Bonferroni corrections to control the groupwide type-I error rates at $\alpha = 0.05$ (Rice 1989). We conducted all analyses with R 2.5.1 (R Development Core Team 2011) using the basic, car, and vegan packages.

RESULTS

Community attributes. We recorded a total of 46 species belonging to 23 families (Appendix 1), among which the most abundant were Rufous-collared Sparrow (*Zonotrichia capensis*, 1.32 ± 0.98 ind/ha, n = 24), Great Kiskadee (*Pitangus sulphuratus*, 0.74 ± 0.55 ind/ha, n = 24), Rufous Hornero (*Furnarius rufus*, 0.62 ± 0.36 ind/ha, n = 24), and Bay-winged Cowbird (*Agelaioides badius*, 0.52 ± 0.70 ind/ha, n = 24).

Species richness, density and diversity showed seasonal changes in both types of habitat, due to lower values in fall and winter (Tukey test: $P < 0.01$) and higher values in spring and summer (Table 1, Fig. 1). This consistency in seasonality was due to high correlations between attributes (all Spearman Rank Correlations > 0.82, n = 24, $P < 0.0001$). There was a positive correlation between richness and density of migratory species throughout the year ($r_s = 0.56$, n = 24, $P < 0.01$), indicating that seasonal changes were partly explained by the arrival of migrants.

We found no significant differences in species richness, density, or diversity between the two habitat types (Table 1). However, we found seasonal differences in species composition between habitat types. These differences were strong during summer ($R = 0.65$, $P < 0.05$) and winter ($R = 0.61$, $P < 0.05$), weaker during spring ($R = 0.41$, $P < 0.05$), and disappeared in fall ($R = 0.13$, $P = 0.20$).

Relationships between bird abundance and vegetation. We found significant relationships between species and the four environmental variables. Both the overall CCA and the first canonical axis were significantly different from randomized data ($F_{4\text{-}4} = 2.00$, $P = 0.02$ and $F_{1\text{-}4} = 4.31$, $P = 0.017$, respectively), based on Monte Carlo permutation tests. The first two axes accounted for 50.2% of the variability present

TABLE 1. Summary of the repeated-measures ANOVA for species richness (species/point), total density (ind/ha) and diversity in the woodland patch and the herbaceous-shrub land at Estación Biológica de Aves Silvestres, Buenos Aires province, Argentina.

Source of variation	df	Species richness		Density		Diversity	
		F	*P*	*F*	*P*	*F*	*P*
Habitat	1	0.345	0.575	0.607	0.462	0.874	0.381
Season	3	22.72	< 0.001	5.427	0.035	14.516	< 0.001
Season x habitat	3	0.443	0.656	1.024	0.345	1.382	0.278

in the bird abundance data. The first axis had an eigenvalue of 0.34 and accounted for 36.0% of the total inertia. The positive extreme of this axis described an increase in both stems and *D. fullonum* densities (correlations with the first axis 0.96 and 0.65, respectively), whereas the negative extreme was associated with higher *G. triacanthos* and *L. lucidum* densities (correlations with the first axis –0.70 and –0.42, respectively). Therefore, the first axis separated woodland from herbaceous-shrub birds (Fig. 2). The second axis (eigenvalue of 0.13, 14.23% of variance explained) had a high positive correlation with *L. lucidum* density (r = 0.73) and a low negative correlation with *G. triacanthos* density (r = –0.38), thus separating birds associated with these two exotic trees (Fig. 2).

We limited our analysis to the 24 species that met our criteria for inclusion in the CCA. This showed that nine species were associated with the shrub-herbaceuos habitat and 15 with the woodland patch. In one extreme, Ru-fous-collared Sparrow, Grassland Yellow-Finch (*Sicalis luteola*), House Wren (*Troglodytes aedon*), Masked Yellowthroat (*Geothlypis aequinoctialis*), Double-collared Seedeater (*Sporophila caerulescens*), Freckle-breasted Thornbird (*Phacellodomus striaticollis*), Hooded Siskin (*Sporagra magellanica*), Spix's Spinetail (*Synallaxis spixi*), and Shiny Cowbird (*Molothrus bonariensis*) were associated with herbaceous-shrub areas (Fig. 2).

Roadside Hawk (*Rupornis magnirostris*), Green-barred Woodpecker (*Colaptes melanochloros*), Rufous-browed Peppershrike (*Cyclarhis gujanensis*), Bay-winged Cowbird, Red-eyed Vireo (*Vireo olivaceus*), Smalled-billed Elaenia (*Elaenia parvirostris*), Streaked Flycatcher (*Myiodynastes maculatus*), White-winged Becard (*Pachyramphus polychopterus*), Great Kiskadee, Narrow-billed Woodcreeper (*Lepidocolaptes angustirostris*), and Rufous Hornero were associated with the woodland patch with higher density of *G. triacanthos*, whereas Picazuro Pigeon (*Patagioenas picazuro*), Eared Dove (*Zenaida auriculata*), Rufous-bellied Thrush (*Turdus rufiventris*), and Epaulet Oriole (*Icterus cayanensis*) were associated with areas of the woodland patch with higher densities of *L. lucidum* (Fig. 2).

DISCUSSION

Vegetation structure and densities of non-native invasive plant species are closely related to bird communities at our study site. The woodland patch and the herbaceous-shrub area showed significant differences in bird species composition. The segregation of birds between different plant communities has been frequently documented (e.g., Laiolo 2002, Corcuera & Zavala-Hurtado 2003, Fleishman *et al.* 2003, Díaz 2006, Jayapal *et al.* 2006), and vegetation structure is considered one of the key components in structuring bird communities (Wiens & Rotenberry 1981, Wiens *et al.*

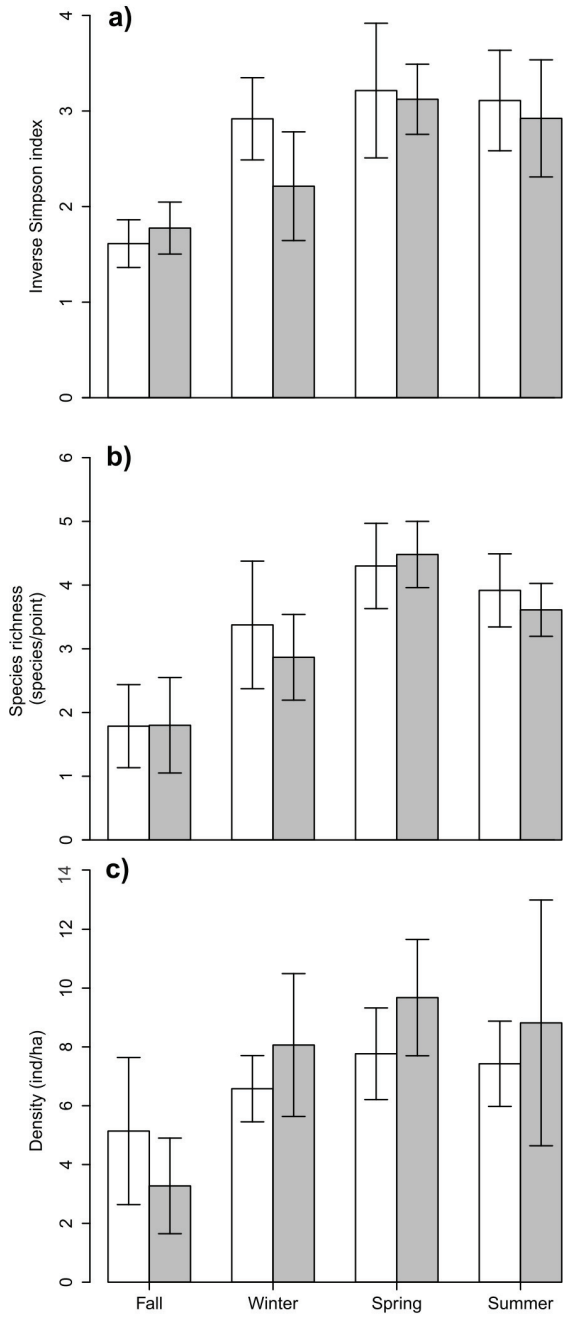

FIG. 1. Mean seasonal variation (± SD) of a) bird diversity, b) species richness (species/point) and c) density (ind/ha) in the woodland patch (white bars) and the herbaceous-shrub area (grey bars) at the Estación Biológica de Aves Silvestres, Buenos Aires province, Argentina.

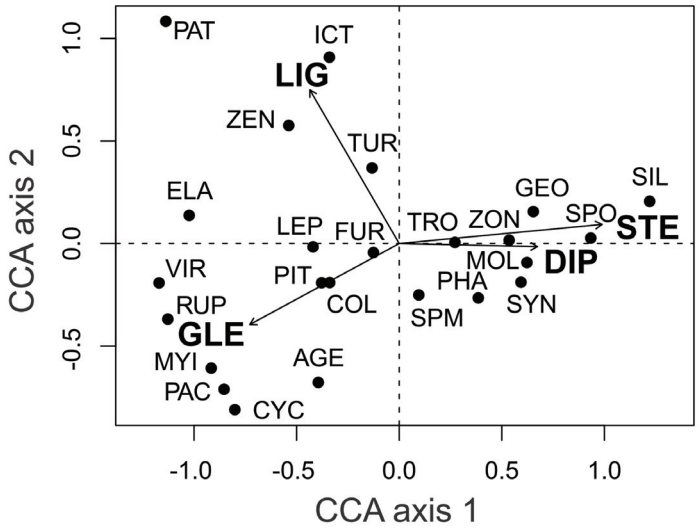

FIG. 2. Location of species scores in the space defined by a canonical correspondence analysis (CCA) of the bird community at the Estación Biológica de Aves Silvestres, Buenos Aires province, Argentina. Variable codes: DIP: *Dipsacus fullonum* density; GLE: *Gleditsia triacanthos* density; LIG: *Ligustrum lucidum* density; STE: stems density.

1987, Bersier & Meyer 1994). Our results demonstrate that vegetation structure remains a key factor in determining bird species composition even in habitats dominated by non-native invasive plants.

In the woodland patch we studied, migrant frugivores-insectivores were associated with *G. triacanthos* and were scarce or absent from *L. lucidum* zones. Since the breeding season of these bird species coincided with a period of *L. lucidum* fruit scarcity, these species were probably tracking arthropod abundance. Thus, the aversion to this tree could be related to the morphology and arrangement of its leaves, which are distributed in an isolated form along the branches and have a coriaceous texture, supporting low arthropod abundance (Cueto & López de Casenave 2002). In addition, the absence of loose or fissured bark and a low diversity of leaf litter may also reduce the habitat for arthropods (Ekert & Bucher 1999). Only four species were associated with high *L. lucidum* densities. This suggests that *L. lucidum* may have a negative effect on bird communities at the local scale by reducing bird diversity, whereas *D. fullonum* and *G. triacanthos* have a comparatively positive effect by providing food resources and nests sites. In particular, *G. triacanthos* seems to be an important resource for migratory species. In temperate native forests of northern Buenos Aires province, species composition is related to forest area at the landscape level, where two major groups of bird species, frugivores-insectivores and granivores, can be distinguished (Horlent *et al.* 2003). These two groups respond either positively or negatively to canopy cover, respectively (Cueto & López de Casenave 2000a, 2000b, Horlent *et al.* 2003), in a pattern similar to that occurring in the woodland patch at our study site. Although mean species richness, abundance, and diversity are much higher in these native forests (see Cueto & López de Casenave 2000a, 2000b), vegetation features are key

factors in determining bird species composition.

We found seasonal changes in community attributes similar to those of temperate native forests in Buenos Aires province (Cueto & López de Casenave 2000a, 2000b). Seasonality in species richness and abundance may be attributed to the arrival of migratory species, such as Smalled-billed Elaenia, Red-eyed Vireo, Streaked Flycatcher, White-winged Becard, Masked Yellowthroat, and Double-collared Seedeater during spring and summer. This migration also strengthens differences in species composition between types of habitat, since Small-billed Elaenia, Red-eyed Vireo, Masked Flycatcher, and White-winged Becard were strongly associated with an increase in the density of *G. triacanthos*, whereas Masked Yellowthroat and Double-collared Seedeater were strongly associated with an increase in the density of both herbaceous stems and *D. fullonum* (Fig. 2).

Our results show that non-native invasive vegetation can structure bird communities in ways similar to native vegetation, suggesting that vegetation structure, native or exotic, may be more important to birds than the actual plant species composition (Hausner *et al.* 2002, Jones & Bock 2005, Sogge *et al.* 2008). Our results also support the idea that some exotic plants, such as *D. fullonum* and *G. triacanthos*, appear suitable for the native avifauna, whereas others, such as *L. lucidum*, have a comparatively negative effect on bird communities. Further studies are needed at the community level in other regions, both to understand how bird communities respond to invasive plants and to effectively conserve native avifauna.

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APPENDIX 1. Mean density of bird species (individuals/ha) in the herbaceous-shrub land (HS) and the woodland patch (W) at Estación Biológica de Aves Silvestres, Buenos Aires Province, Argentina, and species codes of the 24 species included in the CCA. Scientific and common names are taken from Remsen *et al.* (2013).

Common name	Scientific name	Species code	Fall		Winter		Spring		Summer	
			HS	W	HS	W	HS	W	HS	W
Brazilian Teal	*Amazonetta brasiliensis*		0	0	0	0.08	0	0	0	0.21
Neotropic Cormorant	*Phalacrocorax brasilianus*		0	0	0	0	0	0.05	0	0
Great Egret	*Ardea alba*		0	0.06	0	0	0	0	0	0
Snail Kite	*Rostrhamus sociabilis*		0.05	0	0.16	0.08	0	0	0	0
Roadside Hawk	*Rupornis magnirostris*	RUP	0	0.19	0	0.36	0	0.32	0	0.27
Picazuro Pigeon	*Patagioenas picazuro*	PAT	0.05	0.36	0	0.60	0.04	0.11	0	0.37
Eared Dove	*Zenaida auriculata*	ZEN	0.15	0.28	0.10	0.28	0.59	0.74	0.30	1.01
Guira Cuckoo	*Guira guira*		0	0	0	0.16	0	0	0	0
Glittering-bellied Emerald	*Chlorostilbon lucidus*		0	0	0	0	0	0.05	0.13	0.05
Green-barred Woodpecker	*Colaptes melanochloros*	COL	0.05	0.23	0.13	0.24	0.21	0.27	0.08	0.32
Southern Caracara	*Caracara plancus*		0.05	0	0	0	0	0	0	0
Chimango Caracara	*Milvago chimango*		0	0	0	0	0	0.05	0	0
Monk Parakeet	*Myiopsitta monachus*		0	0	0	0	0.68	0	0	0
Narrow-billed Woodcreeper	*Lepidocolaptes angustirostris*	LEP	0.10	0.06	0.10	0.24	0	0	0.04	0.27
Rufous Hornero	*Furnarius rufus*	FUR	0.56	0.40	0.54	0.92	0.17	0.37	0.76	0.64
Freckle-breasted Thornbird	*Phacellodomus striaticollis*	PHA	0.05	0	0.16	0	0.30	0	0.13	0
Chotoy Spinetail	*Schoeniophylax phryganophilus*		0	0	0	0	0.08	0	0.08	0
Spix's Spinetail	*Synallaxis spixi*	SYN	0.10	0	0.13	0	0.08	0	0.21	0.05
Small-billed Elaenia	*Elaenia parvirostris*	ELA	0	0	0	0	0.04	0.80	0.08	0.42
White-crested Tyrannulet	*Serpophaga subcristata*		0	0	0	0.04	0	0	0	0
Bran-colored Flycatcher	*Myiophobus fasciatus*		0.05	0	0	0	0	0	0	0.05
Cattle Tyrant	*Machetornis rixosa*		0	0	0	0.08	0	0	0	0
Great Kiskadee	*Pitangus sulphuratus*	PIT	0.36	0.59	0.29	1.15	0.51	0.95	0.38	0
Streaked Flycatcher	*Myiodynastes maculatus*	MYI	0	0	0	0	0	0	0.04	0.32
Fork-tailed Flycatcher	*Tyrannus savana*		0	0	0	0	0	0	0.04	0
White-winged Becard	*Pachyramphus polychopterus*	PAC	0	0	0	0	0	0.11	0	0.42
Rufous-browed Peppershrike	*Cyclarhis gujanensis*	CYC	0	0	0.03	0.24	0.04	0.16	0	0.11

APPENDIX 1. Continuation.

Common name	Scientific name	Species code	Fall		Winter		Spring		Summer	
			HS	W	HS	W	HS	W	HS	W
Red-eyed Vireo	*Vireo olivaceus*	VIR	0	0	0	0	0	0.27	0	0.16
House Wren	*Troglodytes aedon*	TRO	0.36	0.06	0.06	0.24	0.59	0.11	0.47	0.05
Masked Gnatcatcher	*Polioptila dumicola*		0.20	0	0	0.08	0	0	0.08	0
Rufous-bellied Thrush	*Turdus rufiventris*	TUR	1.02	0.34	0.34	0.36	0.34	0.74	0.25	0.27
Creamy-bellied Thrush	*Turdus amaurochalinus*		0	0	0	0	0	0.11	0	0
Chalked-browed Mockingbird	*Mimus saturninus*		0.05	0	0	0.12	0	0	0	0
Red-crested Cardinal	*Paroaria coronata*		0	0	0	0	0.04	0	0	0
Black-capped Warbling-Finch	*Poospiza melanoleuca*		0.15	0	0	0	0	0	0	0
Saffron Finch	*Sicalis flaveola*		0	0	0	0	0.25	0	0.13	0
Grassland Yellow-Finch	*Sicalis luteola*	SIC	0	0	0	0	1.02	0	0.98	0
Double-collared Seedeater	*Sporophila caerulescens*	SPO	0	0	0	0	0.08	0	1.32	0
Rufous-collared Sparrow	*Zonotrichia capensis*	ZON	0.25	0.13	0.13	0.32	2.59	1.54	2.55	0.58
Masked Yellowthroat	*Geothlypis aequinoctialis*	GEO	0	0	0	0	0.76	0.11	0.17	0
Golden-crowned Warbler	*Basileuterus culicivorus*		0	0	0	0.04	0	0	0	0.11
Variable Oriole	*Icterus pyrrhopterus*	ICT	0.10	0.13	0.13	0.16	0.08	0	0	0
Bay-winged Cowbird	*Agelaioides badius*	AGE	0	1.08	1.08	1.11	0	0.32	0.38	0.64
Screaming Cowbird	*Molothrus rufoaxillaris*		0	0	0	0	0	0	0.04	0
Shiny Cowbird	*Molothrus bonariensis*	MOL	0	0	0	0	0.38	0.11	0	0
Hooded Siskin	*Sporagra magellanica*	SPM	0	0	0	0	0	0.21	0	0